

UNITED STATES PATENT APPLICATION

FOR

ELECTRONIC DEVICE WITH HIDDEN KEYBOARD

INVENTORS:  
DAVID G. ENGLAND

PREPARED BY:

CHARLES K. YOUNG  
INTEL CORPORATION

(408) 765-8080

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## ELECTRONIC DEVICE WITH HIDDEN KEYBOARD

### BACKGROUND OF THE INVENTION

5           1.     Field of the Invention

The described invention relates to an electronic device providing a display output and allowing input via a keyboard or keypad.

10           2.     Description of Related Art

Electronic devices employing display outputs include personal digital assistants (PDA's), palm PC's (such as the Palm Pilot device manufactured by 3COM), still and video cameras, two-way pagers, and so forth. In many cases, a few navigation buttons are used to allow a user to maneuver through displayed data. These electronic devices, however, may have real estate (i.e., area) limitations that may not allow for both a keyboard/keypad and a display output. Handheld devices especially may have these real estate constraints.

If a device has real estate constraints and needs both a keyboard/keypad and a display, a compromise is made. One solution is to use a touch screen LCD to allow the input of text as well as to display images. If keyboard input is desired, a virtual keyboard is displayed on the touch screen LCD. A user can then input information via the virtual keyboard. However, this limits the portion of the touch screen LCD that can be used for displaying images (because a virtual keyboard is also being displayed).



## SUMMARY OF THE INVENTION

A device includes a keyboard and a display. The keyboard allows entry of data into the device, and the display provides an information output. The display has a first position in which the display hides the keyboard, and the display has a  
5 second position in which the keyboard is exposed to allow entry of data via the keyboard. The display is visible to the user in both the first position and the second position.

## BRIEF DESCRIPTION OF THE DRAWINGS

10 Figure 1 shows one embodiment of an electronic device in a read only mode.  
Figure 2 shows one embodiment of an electronic device in a full I/O mode.  
Figure 3 shows one embodiment of the display portion of the present invention.

Figure 4 shows one embodiment of a base portion corresponding to the  
15 display portion of Figure 3.

Figure 5 shows an embodiment of electrically connecting the display portion to the base portion of the electrical device using a flexible connector.

Figure 6 shows an embodiment of mechanically connecting the display portion to the base portion using a sliding mechanical guide.

20 Figures 7A and 7B show an embodiment of a device that includes a display portion coupled to a base portion via a rod that allows the display portion to rotatably move to reveal the keyboard.

Figures 8A – 8C show different views of an embodiment of mechanically connecting the display portion to the base portion using an arm. Figures 8A and 8B are side views. Figure 8C is a top view.

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DETAILED DESCRIPTION

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5 An electronic device having a display that is capable of concealing a keyboard is disclosed. In a "read mode," the display is visible to a user, but the display conceals the keyboard. This mode allows easy access to data and images via the display. When the display is moved to a "full I/O (input/output) mode, the display is still visible to a user, but the display no longer conceals the keyboard. This mode allows the user to input information via the keyboard as well as view information output from the display.

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10 Figure 1 shows a prior art example of an electronic device 10 having a display 20 and maneuver buttons 22. A user is able to view information on the display 20, and the maneuver buttons 22 allow limited input for scrolling through data. The information displayed may comprise pictorial information (images) or textual information (names, appointments, etc.)

15 The "read mode" of the present invention acts the same as that of the prior art Figure 1. This read mode allows the user to conveniently access information and images from the electronic device 10.

20 Figure 2 shows one embodiment of the present invention in its "full I/O mode." This mode is achieved by moving the display 20 so that it no longer conceals a keyboard/keypad 24. The keyboard/keypad 24 may provide a full character set including all letters, numbers and special characters such as that of a typewriter or computer keyboard; or the keyboard/keypad 24 may provide a simplified character set such as the keypad of a touch-tone telephone. The term

keyboard will be used to denote a full character set keyboard, or any subset of a full character set keyboard in which selection of a particular button corresponds to the input of a character (alphanumeric or special character). In both the read mode and the full I/O mode, the display output is visible to the user.

5        Figure 3 shows one embodiment of the display portion 30 of the present invention, and figure 4 shows one embodiment of a corresponding base portion 32 of the present invention. In this embodiment, the display portion 30 and base portion 32 include several electrical contacts 40 that provide an electrical connection between the display portion 30 and the base portion 32.

10        In one embodiment, the display portion 30 is a liquid crystal display (LCD), and the base portion 32 houses a processor, memory, and power source (batteries). However, in an alternative embodiment, the processor, memory and/or power source could be moved into the display portion. The power source could also be provided externally.

15        In one embodiment, the display portion 30 is coupled to the base portion 32 via a serial connection, such as an SPI\* serial bus or an I<sup>2</sup>C\* serial bus, which are well-known serial connections. (SPI is a serial bus developed by Motorola Incorporated as a peripheral interconnect standard. I<sup>2</sup>C is a serial bus developed by Philips Semiconductor.)

20        Figure 5 shows another embodiment of electrically connecting the display portion 30 to the base portion 32 of the electrical device 10. In this embodiment, a flexible connector such as a ribbon cable 42 is connected between the display

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\* Third party names and marks are property of their respective owners.

portion 30 and the base portion 32. A mechanical guide 46 such as grooves along the edges 44 of the base portion 32 (or display portion 30) is used to allow the display portion 30 to slidably move between the read mode and the full I/O mode. Rollers or ball bearings may be employed to allow freer movement within the mechanical guides. In one embodiment, the topside of the display portion 30 raises as its bottomside is moved within the mechanical guides to reveal the keyboard, as shown in Figure 6.

Figures 7A and 7B show an alternative embodiment of a device that includes a display portion 30 coupled to a base portion 32 via a rod 50 that allows the display portion 30 to rotatably move to reveal the keyboard 24. The display portion 30 may employ a curved side to allow rotatable movement. An electrical connection between the display portion 30 and the base portion 32 may be routed through the rod 50.

Figures 8A-8C show an alternative embodiment of mechanically connecting the display portion 30 to the base portion 32 using an arm 60. The arm 60 is bendable and swivels in various directions to allow the display portion 30 to be placed in different positions. An electrical connection from the display portion 30 to the base portion 32 is routed internal to the arm 60.

Figure 8A shows a side view of the device having extendable arm 60. In its read mode, the device's display portion 30 fits within the base portion 32 as shown by the dotted lines. The display portion 30 can also be extended upwards and rotated so that the display faces the user, as shown in Figure 8B. Figure 8C shows a



top view of the display portion 30 that has been extended outward and then rotated about pivot 62.

In one embodiment, contacts or sensors detect the position of the display portion 30 in order to present information to a user with the correct viewing orientation. For example, in the full I/O position of Figure 7B, the device would need to display information using an orientation that is opposite to that of the read mode of Figure 7A. Similarly, the device shown in Figures 8A-8C would need to detect the orientation of the display portion 30. This could be done by detecting the angle of rotation of the pivot points of the arm 60.

The present invention allows input via keyboard to a variety of different devices. For example, in one embodiment, a transmitter is added to communicate signals corresponding to characters input into the device via the keyboard, such as in a two-way pager or a cellular telephone application. In another embodiment, an optical system is added to capture one or more images, such as in a still or video camera application.

Thus, an electronic device having a display that conceals a keyboard is disclosed. The specific arrangements and methods described herein are merely illustrative of the principles of this invention. Numerous modifications in form and detail may be made without departing from the scope of the described invention.

Although this invention has been shown in relation to a particular embodiment, it should not be considered so limited. Rather, the described invention is limited only by the scope of the appended claims.